What is Claimed:

1. A device for testing a refrigerant based system having a plurality of operating parameters, the device comprising:

input means for obtaining the plurality of operating parameters from the refrigerant based system;

memory means for storing a plurality of baseline operating parameters; and

processing means coupled to the input means and the memory for i) processing the plurality of operating parameters, based on the plurality of baseline operating parameters, ii) generating a processing result, and iii) providing the processing result and prompts to a user.

2. The device according to claim 1, wherein the processing result indicates deficiencies in the refrigerant based system.

3. The device according to claim 2, wherein the prompts provide the user with instructions to correct the deficiencies in the refrigerant based system.

4. The device according to claim 3, wherein the user is provided diagnostic information based on the processing result from the processing means.

5. The device according to claim 2, wherein the prompts provide the user with information to identify a problem with the refrigerant based system.

6. The device according to claim 1, wherein the prompts provide the user with instructions to set up the testing of the refrigerant based system.

7. The device according to claim 1, wherein the processing means comprises i) a first processor coupled to the input means and ii) a second processor coupled to the first processor, the first processor providing the processing result to the second processor.

8. The device according to claim 7, wherein the second processor is a Personal Digital Assistant (PDA).

9. The device according to claim 7, wherein the second processor is detachably coupled to the first processor.

10. The device according to claim 1, further comprising display means coupled to the processing means to display the processing result and the prompts to the user.

11. The device according to claim 1, wherein the processing means includes a Weighted Probability Inference Engine (WPIE) to construct failure mode fingerprints of the refrigerant based system.

12. The device according to claim 11, wherein the memory means further stores historic operating data of the refrigerant based system.

13. The device according to claim 12, wherein the failure mode fingerprints are based on the historic operating data stored in the memory means and the operating parameters of the refrigerant based system.

14. The device according to claim 1, wherein the device measures at least one of:

an ambient temperature;

an ambient relative humidity;

a compressor inlet temperature;

a compressor outlet temperature;

a condenser inlet temperature;

a condenser outlet temperature;

an evaporator inlet temperature;

an evaporator outlet temperature;

a TXV inlet temperature;

an orifice inlet temperature;

a TXV outlet temperature;

an orifice outlet temperature;

a vent inlet temperature;

a vent outlet temperature;

an accumulator or receiver inlet temperature; and

an accumulator or receiver outlet temperature,

of the refrigerant based system.

15. The device according to claim 1, further comprising an infrared probe for measuring a temperature of the refrigerant based system.

16. The device according to claim 1, wherein the refrigerant based system is a mobile system.

17. The device according to claim 1, wherein the refrigerant based system is a stationary system.

18. The device according to claim 1, wherein the device is portable.

19. The device according to claim 1, further comprising a refrigerant identifier coupled to the processing means to determine a type and a purity of refrigerant contained within the refrigerant based system.

20. The device according to claim 1, further comprising at least one communication port coupled to the processing means.

21. A probe for measuring a temperature of a refrigeration component of a refrigerant based system having a plurality of refrigeration components, the probe comprising:

an infrared sensor;

a display coupled to the infrared sensor to provide a temperature reading from the infrared sensor to a user; and

a filter for positioning between the infrared sensor the refrigeration component.

22. The probe according to claim 21, further comprising an infrared emitter, wherein the infrared emitter is applied to the refrigeration component, the infrared emitter emitting infrared radiation to the infrared sensor based on the temperature of the refrigeration component.

23. The probe according to claim 22, wherein the infrared emitter is a thermal tape.

24. The probe according to claim 21, further comprising a light source to illuminate the refrigeration component.

25. The probe according to claim 24, wherein the light source is an LED.

26. A probe in temperature communication with ambient air to measure a temperature of the ambient air, the probe comprising:

an infrared sensor;

a display coupled to the infrared sensor to provide a temperature reading from the infrared sensor to a user; and

a filter for positioning between the infrared sensor the ambient air.

27. The probe according to claim 26, further comprising a thermal converter for positioning between the infrared sensor and the filter, wherein the thermal converter converts thermal energy of the ambient air into infrared energy for detection by the infrared sensor.

28. The probe according to claim 27, wherein the thermal converter comprises a metallic black body.

29. A system for measuring a temperature of a refrigerant based apparatus having a plurality of refrigeration components, the system comprising:

an infrared sensor; and

an infrared emitter in temperature communication with one of the plurality of refrigeration components,

wherein the infrared emitter emits infrared radiation to the infrared sensor responsive to the temperature of the one refrigeration component.

30. The system according to claim 29, further comprising a display coupled to the infrared sensor to provide a temperature reading from the infrared sensor to a user.

31. The system according to claim 29, further comprising a filter for positioning between the infrared sensor and the infrared emitter.

32. The system according to claim 29, wherein the infrared emitter is a thermal tape applied to the one refrigeration component.

33. A system in temperature communication with ambient air for measuring a temperature of the ambient air, the system comprising:

an infrared sensor; and

an infrared emitter in temperature communication with the ambient air,

wherein the infrared emitter emits infrared radiation to the infrared sensor responsive to the temperature of the ambient air.

34. The system according to claim 33, further comprising a display coupled to the infrared sensor to provide a temperature reading from the infrared sensor to a user.

35. The system according to claim 33, further comprising a filter for positioning between the infrared sensor and the infrared emitter.

36. The system according to claim 33, wherein the infrared emitter comprises a metallic black body.

37. A process for testing a refrigerant based system having a plurality of operating parameters, the process comprising the steps of:

(a) obtaining the plurality of operating parameters from the refrigerant based system;

(b) storing a plurality of baseline operating parameters;

(c) processing the plurality of operating parameters, based on the plurality of baseline operating parameters and generating a processing result; and

(d) providing the processing result and prompts to a user based on the processing step.

38. The process according to claim 37, wherein the processing step (c) comprises the steps of:

(1) providing system specific data of the refrigerant based system;

(2) interfacing with the refrigerant based system;

(3) obtaining a plurality of internal measurement results from the refrigerant based system including at least one pressure of the refrigerant based system;

(4) obtaining an external measurement result of at least one of i) an ambient temperature and ii) a relative humidity;

(5) determining at least one failure mode fingerprint result of the refrigerant based system;

(6) determining at least one pressure component-mode failure result based on the at least one failure mode fingerprint result of Step (5) and the measurement results of at least one of Steps (3) and (4);

(7) determining a cooling effectiveness result of the system; and

(8) displaying at least one of the results of Steps (3) through (7) to the user.

39. The process according to claim 38, wherein the determining step (5) comprises the steps of:

(i) storing a plurality of predetermined failure modes in a memory;

(ii) initializing a failure mode count;

(iii) retrieving a first one of the plurality of failure modes from the memory;

(iv) determining at least one of a minimum value and a maximum value for the failure mode retrieved in Step (iii);

(v) determining if a respective one of the plurality of internal measurements obtained in step (3) is within the minimum value and the maximum value of the failure mode retrieved in step (iii);

(vi) grading the respective one of the plurality of measurements based on the determination in step (v);

(vii) storing the grading from step (vi) in the memory; and

(viii) repeating Steps (iii) through (vii) for each of the remaining plurality of measurements.

40. The method according to claim 38, wherein the failure mode fingerprints are stored in a matrix configuration.

41. The method according to claim 38, wherein the failure mode fingerprints include at least one of:

i) Low Performing Compressor;

ii) Evaporator Air Flow Restriction;

iii) Missing Orifice Tube;

iv) Slipping Compressor Clutch or Fan Belt;

v) Cooling Fan Disconnected;

vi) Blocked Orifice Tube;

vii) No Problem Detected;

viii) Condenser Restriction;

ix) Blend Door Malfunction;

x) Blocked Condenser Air Flow;

xi) Pressure Switch Setpoint Fault;

xii) Air in Refrigerant Charge;

xiii) 30% Low Refrigerant Charge;

xiv) 40% Low Refrigerant Charge;

xv) Suction Side Restriction;

xvi) Excessive Refrigerant Charge; and

xvii) TXV Valve Fault.

42. The process according to claim 38, further comprising the step of determining a status of a refrigerant contained in the refrigerant based system.

43. The process according to claim 38, wherein the step (6) of determining at least one pressure component-mode failure result further comprises the steps of:

(i) obtaining a high side pressure data and a low side pressure data from the refrigerant based system;

(ii) storing a maximum and a minimum value for each of the high side pressure data and the low side pressure data;

(iii) determining if a refrigerant is present in the refrigerant based system;

(iv) providing diagnostic information to the user based on the determination in step (iii);

(v) calculating a difference in pressure between the high side pressure and the low side pressure;

(vi) providing diagnostic information to the user based on the calculation in step (v); and

(vii) determining a clutch cycling speed of the refrigerant based system based on the data from steps (i) and (ii).

44. The process according to claim 37, further comprising the step of determining a refrigerant purity of a refrigerant within the refrigerant based system.

45. The process according to claim 37, further comprising the steps of:

(a) measuring a change in temperature across at least one of a plurality of components of the refrigerant based system;

(b) constructing a test profile for the refrigerant based system based on the temperature measurements;

(c) providing a plurality of failure modes for the refrigerant based system;

(d) comparing the test profile with the plurality of failure modes;

(e) determining at least one potential failure mode match based on the comparison;

(f) assigning a probability to each potential failure mode match; and

(g) storing each potential failure mode match into a memory based on the assigned probability.

46. A device for testing a refrigerant based system having a plurality of operating parameters, the device comprising:

input means for obtaining the plurality of operating parameters from the refrigerant based system;

a memory for storing a plurality of baseline operating parameters;

a Weighted Probability Inference Engine (WPIE) to construct failure mode fingerprints of the refrigerant based system based on the plurality of baseline operating parameters and the plurality of operating parameters of the refrigerant bases system;

a second processor coupled to the memory means and containing the WPIE, the WPIE providing the failure mode fingerprints to the second processor, the second processor displaying prompts and troubleshooting information to a user based on the failure mode fingerprints.

47. The device according to claim 46, wherein the second processor is detachably coupled to the Weighted Probability Inference Engine.